CLAIMS

What is claimed is:

1. A method for growing a mono-crystalline emitter for a bipolar transistor, comprising: providing a trench (14) formed on a silicon substrate (16) having opposed silicon oxide side walls (12); selectively growing a highly doped mono-crystalline layer (18) on the silicon substrate (16) in the trench (14); and non-selectively growing a second silicon layer (20) over the trench in order to form an amorphous or polysilicon layer over the silicon oxide sidewalls.

2. The method of claim 1, wherein the step of selectively growing a highly doped mono-crystalline layer is accomplished using selective epitaxial growth (SEG).

3. The method of claim 2, wherein the selective epitaxial growth using a precursor selected from the group consisting of: SiH_2Cl_2, SiH_4, $SiCl_4$, $SiCl_3$, $Si2H_6$, Si_3H_8, GeH_4, and SiH_3CH_3.

4. The method of claim 1, wherein the step of non-selectively growing the second silicon layer is accomplished using differential epitaxial growth (DEG).

5. The method of claim 1, wherein the mono-crystalline layer (18) is substantially grown only on an active area on the silicon substrate.

6. The method of claim 1, comprising the further step of performing a salicidation process using a silicide selected from the group consisting of: titanium, cobalt and nickel.

7. The method of claim 1, wherein the mono-crystalline emitter is n-typed doped with an element selected from the group consisting of: phosphorous (P) and arsenic (As).

8. A method for forming a highly n-type doped layer in a semiconductor wafer, comprising: providing a first active region comprised of a silicon substrate (16); providing a second region comprised of silicon oxide (12); selectively growing a highly doped mono-crystalline layer (18) on the silicon substrate; and non-selectively growing a second silicon layer (20) over the silicon substrate and silicon oxide to form an amorphous or polysilicon layer over the silicon oxide (12).

9. The method of claim 8, wherein the step of selectively growing a highly doped mono-crystalline layer is accomplished using selective epitaxial growth.

10. The method of claim 8, wherein the selective epitaxial growth uses a precursor selected from the group consisting of: SiH_2Cl_2 and SiH_4, $SiCl_4$, $SiCl_3$, $Si2H_6$, Si_3H_8, GeH_4, and SiH_3CH_3.

11. The method of claim 8, wherein the step of non-selectively growing the second silicon layer is accomplished using differential epitaxial growth.

12. The method of claim 8, wherein the mono-crystalline layer is substantially grown only on the active region.

13. The method of claim 8, comprising the further step of performing a salicidation process using a silicide selected from the group consisting of: titanium, cobalt and nickel.

14. The method of claim 8, wherein the highly n-type doped layer is doped with an element selected from the group consisting of: phosphorous (P) and arsenic (As).

15. A method for growing a mono-crystalline emitter for a bipolar transistor, comprising: providing a trench (14) formed on a substrate (16) having opposed silicon oxide side walls (12); growing a highly doped layer (18) on the substrate in the trench (14) using selective epitaxial growth; and growing a second layer (20) over the trench (14) using differential epitaxial growth in order to form an amorphous or polysilicon layer over the silicon oxide sidewalls.

16. The method of claim 15, wherein the selective epitaxial growth using a precursor selected from the group consisting of: SiH_2Cl_2, SiH_4, $SiCl_4$, $SiCl_3$, $Si2H_6$, Si_3H_8, GeH_4, and SiH_3CH_3.

17. The method of claim 15, wherein the highly doped layer comprises a mono-crystalline layer that is substantially grown only on an active area on the substrate.

18. The method of claim 15, comprising the further step of performing a salicidation process using a silicide selected from the group consisting of: titanium, cobalt and nickel.

19. The method of claim 15, wherein the mono-crystalline emitter is n-typed doped with an element selected from the group consisting of: phosphorous (P) and arsenic (As).

20. The method of claim 15, wherein the mono-crystalline emitter is p-typed doped using boron (B).